

J. MORGAN.
GAS CLEANING APPARATUS.
APPLICATION FILED AUG. 17, 1907.

948,062.

Patented Feb. 1, 1910.

2 SHEETS—SHEET 1.

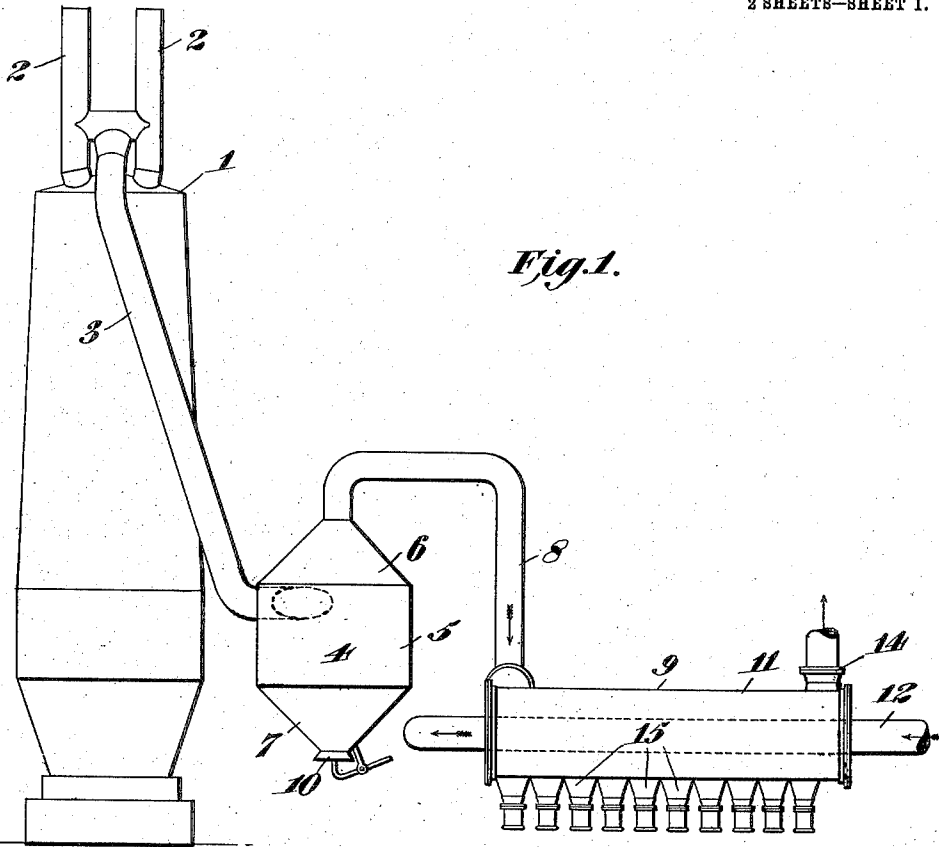


Fig. 1.

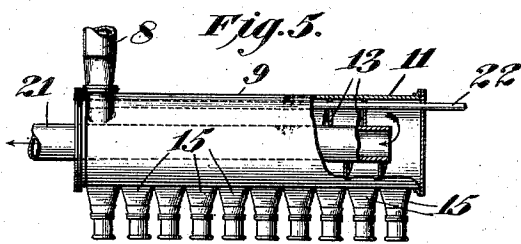


Fig. 5.

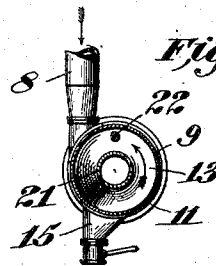


Fig. 6.

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2 SHEETS—SHEET 2.

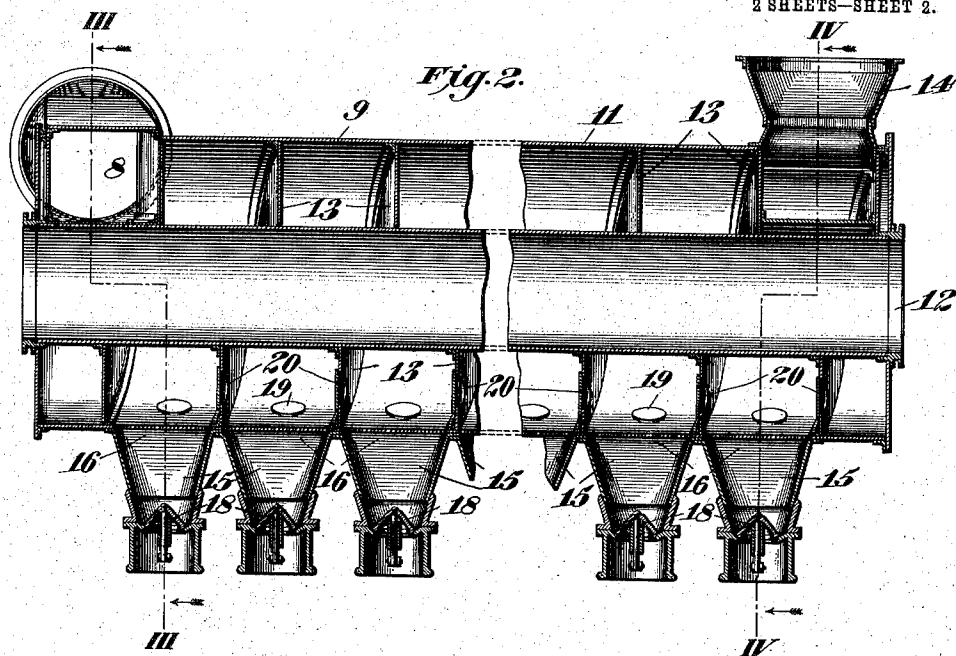


Fig. 3.

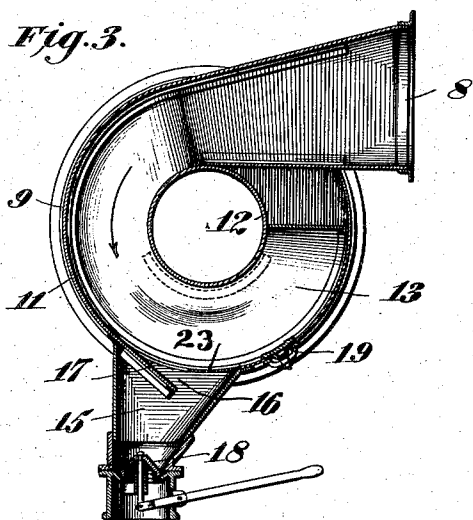
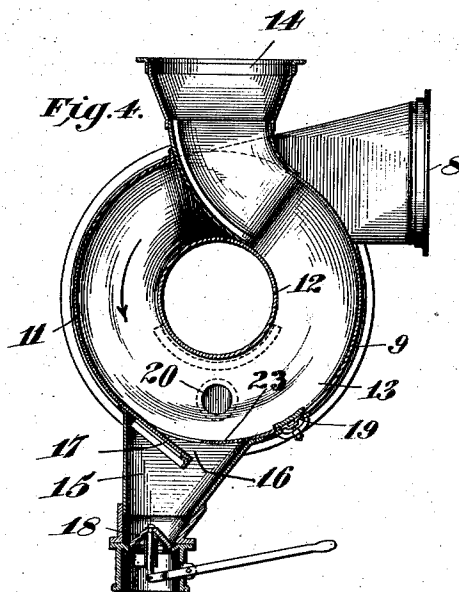


Fig. 4.



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UNITED STATES PATENT OFFICE.

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GAS-CLEANING APPARATUS.

948,062.

Specification of Letters Patent.

Patented Feb. 1, 1910.

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To all whom it may concern:

Be it known that I, JOSEPH MORGAN, a citizen of the United States, residing in the borough of Westmont, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Gas-Cleaning Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to gas cleaning apparatus and more particularly to apparatus for cleaning the gas issuing from blast furnaces.

The object of my invention is to provide means for separating the heavier and finer particles of solid material from the gas by gravity and centrifugal action, means for reheating the gas before using, and also means for washing the gas in such cases where that course is desirable, and the invention consists in the novel construction hereinafter described and claimed. My cleaning apparatus can also be used in connection with metallurgical processes for the extraction of valuable particles from the gases or from the dust and for various similar purposes in the different arts.

In the accompanying drawings forming part of this specification and in which similar characters refer to corresponding parts, Figure 1 is a diagrammatic view of the tunnel head of a furnace and of my improved gas cleaner connected thereto; Fig. 2 is a longitudinal section of a portion of the device; Fig. 3 is a vertical transverse section taken on the line III—III of Fig. 2; Fig. 4 is a similar section taken on the line IV—IV of Fig. 2; Fig. 5 is a view partly in elevation and partly in longitudinal section of a modification, and Fig. 6 is a vertical transverse section of a modified form showing parts in side elevation.

Referring to the drawings by number, 1 represents the tunnel-head of a furnace having the risers 2 which are preferably in pairs, each pair being connected with a down-comer 3 which is brought to a level suitable for the location of the cleaning apparatus. A dust-catcher 4 located between the furnace and the main section of the cleaning apparatus has an opening in the

side thereof to which the down-comer is connected. This dust-catcher consists of a central, cylindrical portion 5 with conical upper and lower sections 6 and 7, and the down-comer is connected with the cylindrical portion at a point near the top thereof. At the apex of the cone forming the upper section, a pipe 8 is connected, which leads to the separator and cleaner 9, and the lower conical section is provided with an opening, normally closed by a dust-valve 10, of the ordinary construction.

The cleaning apparatus 9 consists of a horizontal cylindrical casing 11 with a passageway or gas return pipe 12 extending through the central portion thereof, and an internal helical partition 13 located between the outer casing and the central return pipe or conductor just referred to. An outlet 14, through which the gas passes as it leaves the apparatus, is located at the end of the casing. Connected to the lower side of the casing 11 and located between each of the flanges of the helical partition is a trap 15 into which the dust falls through the opening 16, between the circumferential portion 23 of the casing 11, and the approximately tangential portion 17 which latter is turned downward as shown, this arrangement serving to catch and retain the dust particles in the trap 15, as they are projected therein by the combined action of centrifugal force and gravity. The traps are normally closed by dust-valves 18 of the ordinary construction. The traps are substantially frustum-shaped in cross section and the upper portion of the side walls coincides with the flanges of the helical partition, thereby forming a continuous chamber for the passage of the dust particles. In the drawings I have shown these traps as located on the lower side of a horizontal casing, but it is not essential that this particular form of construction should be adhered to, inasmuch as the force of the current of gas is sufficient to carry the dust into the traps if the latter are connected to the sides of a casing arranged vertically. On the other hand, if the separating apparatus is arranged horizontally the force of gravity may be depended upon to aid in carrying the heavier particles to the bottom. Cleaning holes 19 and 20 in the casing and flanges are closed by ordinary covers.

In the modification shown in Figs. 5 and 6, the central return pipe 21 terminates at a given point within the outer casing, as shown, and communicates with the passageway formed by the helical partition, so that the gas issuing from this passageway does not make its exit from the casing until it has passed through said return. In this modification I have also shown a water pipe 22 located near the inner surface of the casing, in this instance on the upper side thereof, and passing through the flanges of the helical partition.

The operation of the apparatus is as follows:—The gas passing from the furnace enters the dust-catcher 4 through the connecting pipe 3 and by reason of the decreased velocity of the gases in said dust-catcher due to its large size as compared with its connecting pipes, the heavier particles carried by the gas gradually fall by gravity to the lower conical section 7, where the force of current is diminished, the dust descending to the lowest point, where it can be readily removed by the operation of the valve 10. The gas freed from these heavier particles is then drawn off through the pipe 8, and is carried to my separating apparatus 9, where it is conducted through the space between the flanges of the helical partition and escapes through the outlet 14. During the passage of the gas through the spaces formed by the flanges of the helical partition, the particles of dust will fall into the traps and will be held there until removed by the operation of the valves 18. The plates 17, partially covering the entrance to the traps, prevent the current of gas from stirring up the dust after it has passed from the cleaner proper, and owing to the fact that the side walls of the traps coincide with the walls of the helical partition, there is as little obstruction as possible in the path of the dust particles. It will thus be seen that both centrifugal force and the force of gravity are made use of in the process of separation. In reheating the gas before using it, in order that the temperature of combustion may be higher, it is passed through the central return pipe 12, where it will take up a portion of the heat given off by the gas passing around the return pipe.

In using the modification shown in Figs. 5 and 6 the gas is sprayed with water as it passes through the space between the flanges of the helical partition, and then immediately enters the central return pipe without passing from the casing. During the passage through the return pipe the gas is reheated and as a portion of the heat is thus extracted from the gas flowing around the return pipe, less water is required for the washing operation. The water sprayed into the apparatus renders the dust particles heavier and they are thereby carried to the

bottom and into the traps more rapidly, and the pools of water formed in the traps will still further aid in the operation of separating the foreign material from the gas.

Although I have shown and described my improved gas cleaner in considerable detail, I do not wish to be limited to the exact and specific details set forth, but may use such substitutions, modifications or equivalents thereof, as are embraced within the scope of my invention, as pointed out in the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a gas cleaning apparatus, an outer casing, a helical partition therein forming a gas passageway, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, thereby forming a continuous chamber for the passage of the dust particles, and dust-valves located at the lower ends of the traps.

2. In a gas cleaning apparatus, an outer casing, a helical partition therein forming a gas-passageway, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, thereby forming a continuous chamber for the passage of the dust particles, plates partially covering the entrance to the traps, and dust valves located at the lower ends of said traps.

3. In a gas cleaning apparatus, an outer casing, a central return pipe, a helical partition surrounding the latter forming a gas-passageway, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, thereby forming a continuous chamber for the passage of the dust particles, and dust-valves located at the lower ends of the traps.

4. In a gas cleaning apparatus, an outer casing, a central return pipe, a helical partition surrounding the latter forming a gas-passageway, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, plates partially covering the entrance to the traps, and dust-valves located at the lower ends of said traps.

5. In a gas cleaning apparatus, an outer casing, a helical partition therein forming a gas-passageway, dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, thereby forming a con-

tinuous chamber for the passage of the dust particles, and dust-valves located at the lower ends of the traps.

6. In a gas cleaning apparatus, an outer casing, a central return pipe, a helical partition therein forming a gas-passageway, dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, and dust-valves located at the lower ends of the traps.

7. In a gas cleaning apparatus, an outer casing, a central return pipe, a helical partition surrounding the latter forming a gas-passageway, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, thereby forming a continuous chamber for the passage of the dust particles, and dust-valves located at the lower ends of said traps.

8. In a gas cleaning apparatus, a horizontal outer casing, a helical partition therein forming a gas-passageway, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, thereby forming a continuous chamber, and dust-valves located at the lower ends of the traps.

9. In a gas cleaning apparatus, an outer casing located horizontally, a helical partition therein forming a gas-passageway, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, thereby forming a continuous chamber, plates partially covering the entrance to the traps, said casing being pro-

vided with openings in the sides adjacent to the traps, and dust-valves located at the lower ends of said traps.

10. In a gas cleaning apparatus, a horizontal outer casing, a helical partition therein forming a gas-passageway, a central return pipe passing through the helical partition, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, thereby forming a continuous chamber for the passage of the dust particles, dust-valves located at the lower ends of the traps, plates partially covering the entrance to the traps, said casing being provided with openings in the sides, adjacent to the traps, the partition also being provided with openings in that portion which adjoins the traps.

11. In a gas cleaning apparatus, a horizontal outer casing, inlet and outlet pipes connected thereto, a helical partition therein forming a gas-passageway, a central return pipe passing through the helical partition, frustum-shaped dust-traps secured to the casing between successive turns of the helical partition, the upper portion of said traps being of substantially the same width as the gas-passageway, dust-valves located at the lower ends of the traps, plates partially covering the entrance to the traps, said casing being provided with openings in the sides adjacent to the traps, and the partition also being provided with openings in that portion adjoining the traps.

In testimony whereof I hereto affix my signature in the presence of two witnesses.

JOSEPH MORGAN.

Witnesses:

GEO. E. THACKRAY,
IVAR OLSSON.